CLAIMS

I claim:

1. A noninvasive method and system to determine cerebral blood flow velocity response to face recognition tasks in a human subject, including steps of:

(a) obtaining a subject's cerebral blood flow velocity in cerebral arteries on both sides of the brain using transcranial Doppler ultrasound instrument with two probes placed on the temples and sample volumes focused on cerebral vessels on both sides;

(b) simultaneously with (a) obtaining the mean blood flow velocity in both cerebral arteries at baseline;

(c) testing the subject on the screen of a digital computer and using a computer input peripheral device while simultaneously monitoring the mean blood flow velocity during each stage of the task in real-time;

(d) determining the response of the brain using mean cerebral blood flow velocity to a particular face retrieved from the database;

(e) determining side-to-side differences in mean cerebral blood flow velocity response to the face retrieved from the database;

(f) determining the spectrum analysis of the brain using the mean blood flow velocity response to the retrieved face;

(g) simultaneously with (f) obtaining the spectral density plots for both arteries;

(h) simultaneously with (g) identifying the respective frequency components for the left and right arteries;

(i) determining the brain response to the real face using laterality index

and spectrum analysis of mean blood flow velocity oscillations;

(j) determining the cross-amplitude as a measure of covariance between the respective frequency components in the two series determined for the retrieved face and real face for each artery respectively;

(k) simultaneously with (j) determining the squared coherency as a measure of the squared correlation between the cyclical components in the two series at the respective frequency; and

(l) cross matching the brain response pattern to the real face as compared to that of the retrieved face.

2. The invention of claim 1 wherein the said device is operatively connected to a portable microcomputer that processes and displays the cerebral blood flow velocity, laterality index, faces, spectrum analysis, records, fingerprints and other biometric information in an integrated database or as a combination of selected data options.

3. The invention of claim 2 wherein the said device is operatively connected to a computer workstation for more extensive search and cross matching of faces to spectrum analysis and comparison by an operator.

4. The invention of claim 3 wherein the said device is a microcomputer operatively connected to a global positioning system.

5. The invention of claim 4 and further including a computer workstation means for retrieving the faces from an immigration, forensic, advertising or plastic surgery database.

6. The invention of claim 5 wherein the task involved relates to odor evaluation.

7. The invention of claim 5 wherein the task involved is a mental

performance task and reflects the face-minder's perception of overall state-of-being of the immigrant.

8. The invention of claim 5 wherein the display of the microcomputer is operatively connected to an eye-piece monitor with optional voice control.

9. A noninvasive method and system to determine cerebral blood flow velocity response to face recognition tasks in a human subject, including steps of:

(a) obtaining a subject's cerebral blood flow velocity in cerebral arteries on both sides of the brain using transcranial Doppler ultrasound instrument with two probes placed on the temples and sample volumes focused on cerebral vessels on both sides;

b) simultaneously with (a) obtaining the mean blood flow velocity in both cerebral arteries at baseline;

(c) testing the male subject on the screen of a digital computer and using a computer input peripheral device while simultaneously monitoring the mean blood flow velocity during each stage of the task in real-time;

(d) determining the response of the brain using mean cerebral blood flow velocity to a particular face retrieved from the database;

(e) determining side-to-side differences in mean cerebral blood flow velocity response to the face retrieved from the database;

(f) determining the spectrum analysis of the brain using the mean blood flow velocity response to the retrieved face;

(g) simultaneously with (f) obtaining the spectral density plots for both arteries;

(h) simultaneously with (g) identifying the respective frequency components for the left and right arteries;

(i) determining the brain response to the real face using laterality index and spectrum analysis of mean blood flow velocity oscillations;

(j) determining the cross-amplitude as a measure of covariance between the respective frequency components in the two series determined for the retrieved face and real face for each artery respectively;

(k) simultaneously with (j) determining the squared coherency as a measure of the squared correlation between the cyclical components in the two series at the respective frequency; and

(l) determining if there is a match of the brain response pattern to the real face as compared to that of the retrieved face.

10. The invention of claim 9 wherein the said device is operatively connected to a portable microcomputer that processes and displays the cerebral blood flow velocity, laterality index, faces, spectrum analysis, personal records, fingerprints and other biometric information in an integrated database or as a combination of selected data options.

11. The invention of claim 10 wherein the said device is operatively connected to a computer workstation for more extensive search and cross matching of faces to spectrum analysis.

12. The invention of claim 10 wherein the said device is operatively connected to a computer workstation to trigger a more extensive search and cross matching of faces by a female operator.

13. The invention of claim 12 and further including a computer workstation means for retrieving the faces from a forensic or immigration biometric database.

14. The invention of claim 12 and further including a telecommunication

means to connect to a computer workstation database.

15. A noninvasive method and system to determine cerebral blood flow velocity response to object recognition tasks in a human subject, including steps of:

(a) obtaining a subject's cerebral blood flow velocity in cerebral arteries on both sides of the brain using transcranial Doppler ultrasound instrument with two probes placed on the temples and sample volumes focused on cerebral vessels on both sides;

b) simultaneously with (a) obtaining the mean blood flow velocity in both cerebral arteries at baseline;

(c) testing the subject on the screen of a digital computer and using a computer input peripheral device while simultaneously monitoring the mean blood flow velocity during each stage of the task in real-time;

(d) determining the response of the brain using mean cerebral blood flow velocity to a particular image of an object retrieved from the database;

(e) determining the response of the brain using side-to-side differences in mean cerebral blood flow velocity response to the image of the object retrieved from the database;

(f) determining the spectrum analysis of the brain using the mean blood flow velocity response to the retrieved image of the object;

(g) simultaneously with (f) obtaining the spectral density plots for both arteries;

(h) simultaneously with (g) identifying the respective frequency components for the left and right arteries;

(i) determining the brain response to the real object using laterality index and

spectrum analysis of mean blood flow velocity oscillations;

(j) determining the cross-amplitude as a measure of covariance between the respective frequency components in the two series determined for the retrieved image of the object and real object for each artery respectively;

(k) simultaneously with (j) determining the squared coherency as a measure of the squared correlation between the cyclical components in the two series at the respective frequency; and

(m) determining if there is a match of the brain response pattern to the real object as compared to that of the retrieved image of the object.

16. The invention of claim 15 wherein the said device is operatively connected to a portable microcomputer that processes and displays the cerebral blood flow velocity, laterality index, images of objects as well as the spectrum analysis in combination or as selected options.

17. The invention of claim 16 wherein the said device is operatively connected to a computer workstation for more extensive search and cross matching of the image of the object to spectrum analysis.

18. The invention of claim 17 wherein the image of the object under study comprise audiovisual scenes.

19. The invention of claim 17 wherein the object under study comprise odor specific characteristics.

20. The invention of claim 17 and further including a computer workstation means with human-computer interface system for object and facial recognition tasks for use in forensics, medicine and advertising.